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ABSTRACT

This document is one of ten curriculum guides developed by the Nevada Competency-Based Adult High School Diploma (CBAHSD) Project. This curriculum guide on environmental education is divided into seven topics. The topics included are Human Carrying Capacity (The Ability to Foresee and Forestall), Human Population Growth, The Atmosphere, The Hydrosphere, The Lithosphere, Energy, and Ecosystem Components. Competency statements and performance indicators are provided for each topic area. The performance indicators are designed to be used as pre- and post-tests. Answer keys are also provided. This set of curriculum guides is accompanied by both a teacher's guide and a student handbook. (BM)

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CE 024 143

ENVIRONMENTAL EDUCATION

NEVADA COMPETENCY BASED
ADULT HIGH SCHOOL DIPLOMA PROJECT

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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TOPICS

Human Carrying Capacity:
The Ability to Foresee & Forestall

Human Population Growth:
Interactions

The Atmosphere

The Hydrosphere

The Lithosphere

Energy

Ecosystem Components

ENVIRONMENTAL EDUCATION

Human Carrying Capacity

EE - 1

Pre-test: #1 and #2
Post-test: #4

The student will describe, from a choice of various industrial activities, those which involve externalities and those that are internalities.

PERFORMANCE INDICATORS:

1. An example of an industrial activity which may be considered a cost to an individual or business, but not to the public at large is:

   a) a tax placed on water pollution which requires the polluter to pay a proportionate tax relative to the amount of pollution

   b) expansion of a plant to enlarge a business

   c) air pollution from the stacks of a copper smelter

   d) the purchase of a water pollution control device by the business

   e) the corporation developing a computer program to monitor the polluting activities of the business

   Discuss your selection with your teacher.

2. Given each of the four industrial activities listed below, the student will describe those which involve costs to individuals or businesses and those that are costs to the public at large.
   Place the correct letter in the blank.

   a = cost to an individual or business b = cost to public at large

   _____ 1. air pollution from the stacks of a copper smelter

   _____ 2. the purchase of an air pollution control device

   _____ 3. expansion of the plant to enlarge the business

_____ 4. degraded waste water from a chemical plant being returned to a stream

3. An economic externality, considered by many economists to be a basic cause of polluting activities by business, may be defined as:

   a) the capitalistic system of private profit motivation

   b) the "puritan" ethic, which is a basic, although external, part of our culture

   c) failure to reinvest capital into a business venture, requiring external or government funding to continue the growth of a business

   d) costs borne by the general public for processes which result in private profit

   e) cartels by foreign nations in the sale of natural resources to developed countires, thus externally increasing costs of production

4. Many economists contend that the fundamental cause of much of our air and water pollution is the result of economic externalities, or costs which are borne by the public at large and not just by an individual or a business. Given the foregoing, the student will describe in writing or orally, three different industrial activities which result in pollution because of economic externalities. He will suggest ways in which such externalities could be changed to internalities and hence reduce pollution.

ENVIRONMENTAL EDUCATION

Human Carrying Capacity

EE - 2

Pre-test: #1 and #3
Post-test: #2 and #4

The student will identify and discuss the governmental level (city, state, federal) which would most likely be involved in legal actions to control different pollution problems.

PERFORMANCE INDICATORS:

1. Which of the following governmental levels would most likely be involved in requiring legal actions to control the different pollution problems

   a = city b = state c = federal

   1) discharge of waste material into the Colorado River _____

   2) deterioration of air quality in the New York City area _____

   3) setting uniform standards for copper smelter stack effluents _____

   4) determining suitable weather conditons for open burning of trash materials _____

2. The following is an example of a pollution problem most likely to be resolved on a local level, rather than by federal control:

   a) discharge of waste material into the Colorado River

   b) deterioration of air quality in the New York City region

   c) setting uniform standards for copper smelter stack effluents

   d) determining suitable weather conditions for open burning of trash materials

3. Group the following pollution problems into those most likely to be controlled by the federal government.

   1) discharge of waste material into the Colorado River

   2) deterioration of air quality in the New York City region

   3) setting uniform standards for copper smelter stack effluents

   4) determining suitable weather conditions for open burning of trash materials

4. The federal government has required minimum standards of air and water quality of each of the states. States and local cities often claim that they best understand the economics and tolerable pollution levels of their area, and that federal standards are often an intrusion into local rights. Write an essay either defending the role of the federal government in pollution control, or defending the rights of state and local governments in setting local standards.

ENVIRONMENTAL EDUCATION

Human Carrying Capacity

EE - 3

Pre-test: #1 and #2

Post-test: #3 and #4

The student will compare, contrast, or discuss modes of transportation and a hypothetical destination by identifying or stating the advantages of one over the other using at least one of the following categories: cost per passenger mile, fuel consumption per passenger mile, capability of reaching desired destination, time to reach desired destination, and safety.

PERFORMANCE INDICATORS:

1. For each destination, compare the two methods of transportation listed. State an advantage that each has in at least one of the following groups.

   a) cost per passenger mile

   b) pollution (air or noise) per passenger mile

   c) fuel consumption per passenger mile

   d) capability of reaching desired destination

   e) time to reach desired destination

   f) safety (accidents per passenger mile) in reaching destination

1) rapid transit vs. automobile go get to work during rush hour
   a.
   b.

2) plane vs. automobile for a family of four to go from Las Vegas to Barstow
   a.
   b.

3) train vs. bus for a family of four to go from Reno to Chicago
   a.
   b.

4) bicycle vs. automobile for an individual to go to the store one-half mile away
   a.
   b.

2. Order the transportation methods below by placing an "X" next to the best method for each of the categories stated. Discuss your selection with your teacher.

   Category 1 - cost per passenger mile
   a) bus across the United States
   b) automobile across the United States

   Category 2 - pollution (air or noise) per passenger mile
   a) rapid transit to work in rush hour
   b) automobile to work in rush hour

   Category 3 - fuel consumption per passenger mile
   a) train across the United States
   b) automobile across the United States

   Category 4 - capability of reaching desired destination
   a) rapid transit to place of work
   b) automobile to place of work

   Category 5 - time to reach desired destination
   a) plane to Baltimore
   b) train to Baltimore

   Category 6 - safety (accidents per passenger mile)
   a) automobile to Denver
   b) commercial plane to Denver

3. Choose two modes of transportation and a hypothetical destination and describe at least one advantage of each over the other for each of the following categories:

   a) cost per passenger mile

   b) pollution (air or noise) per passenger mile

   c) fuel consumption per passenger mile

d) capability of reaching desired destination

e) time to reach desired destination

f) safety (accidents per passenger mile) in reaching destination

4. State the environmental advantages and disadvantages of each of the following modes of travel:

a) airplane

b) automobile

c) bicycle

d) train

e) bus

ENVIRONMENTAL EDUCATION

Human Carrying Capacity

The student will indicate ways the city must depend on the environment outside the city by naming substances or objects necessary for an urban activity and stating their origin in the natural environment.

EE - 4

Pre-test: #1 and #3
Post-test: #2 and #4

PERFORMANCE INDICATORS:

1. Given that cities are dependent upon the natural environments outside the city, the student will match the following list of substances or objects necessary for an urban activity with the accompanying list the most likely origin in the natural environment.

_____ 1. gasoline for car	a. mines
_____ 2. nails	b. farms
_____ 3. wool sweater	c. oil wells
_____ 4. can of tuna fish	d. forests
_____ 5. loaf of bread	e. rivers or lakes
_____ 6. pad of paper	f. oceans

2. Given five activities in a city, the student will show the city is dependent on the outside environment by naming two substances which must be brought into the city to perform this activity and stating their origin in the natural environment.

   1) fireman fighting a fire

   2) carpenter building a house

   3) groceryman selling food

   4) person driving a car

   5) mother putting clothes on a baby

3. Given that urban environments are dependent upon natural environments outside the city and given the following list of natural environments, the student will choose the substance or object derived from the natural environment.

_____ 1. forests	a. gasoline for car
_____ 2. mines	b. nails
_____ 3. oil wells	c. wool sweater
_____ 4. rivers, lakes, or wells	d. can of tuna fish
_____ 5. oceans	e. glass of water
_____ 6. farms	f. pad of paper

4. Given that cities are dependent upon the natural environment outside the urban area, the student will discuss, in writing or orally, the origins outside the city of four substances or objects which are commonly used in a city. For each of the substances, the student will describe how a shortage of the natural resource would affect life in the city.

ENVIRONMENTAL EDUCATION

Human Carrying Capacity

The student will be able to identify the four major aspects of a city environment (residential, commercial, industrial, or open space) in which a building or urban activity is most likely to be found or be compatible.

E - 5

Pre-test: #1 and #2
Post-test: #3 and #4

PERFORMANCE INDICATORS:

1. Given the buildings or activities listed below, the student will indicate the letter preceeding one of the four parts of the city in which it would most likely be found.

_____ 1. house	
_____ 2. shopping center	
_____ 3. theater	a. residential
_____ 4. oil refining	b. commercial
_____ 5. zoo	c. industrial
_____ 6. manufacturing	d. open space
_____ 7. school	
_____ 8. wildlife refuge	

2. Given the following buildings or activities, the student will group into sets which indicate in which of four parts of a city they would most likely to be found.

a) house	d) oil refinery	g) school
b) shopping center	e) zoo	h) wildlife refuge
c) theater	f) manufacturing	i) auto sales

residential	commercial	industrial	open space

3. Given a community divided into four major use categories (residential, commercial, industrial, and open space), the student, acting as an urban planner for his town, will list each of the following activities or buildings into the use category which he judges to be most applicable.

a) house	d) oil refining	g) school
b) shopping center	e) zoo	h) wildlife refuge
c) theater	f) manufacturing	i) auto sales

residential	commercial	industrial	open space

4. Given the design of an urban area in regard to suitable uses in residential, commercial, industrial, and open space, the student will discuss and create a map of an urban area outlining the different uses he considers compatible.

ENVIRONMENTAL EDUCATION

Human Population Growth

The student will identify and describe from a set of several alternatives, those which best account for the numerical changes in human population.

EE - 6

Pre-test: #1 and #3
Post-test: #2 and #4

PERFORMANCE INDICATORS:

1. Mark an "X" next to the alternatives which best explain why the population has changed in size from time 1 until time 2. (Consider each alternative separate from the others.) Discuss your selections with your teacher.

   1) Time 1: 6 people → Time 2: 40 people

   _____ a. excess of births over deaths

   _____ b. increase in emigration since Time 1

   _____ c. increased death rate

   _____ d. immigration and emigration are the same

   _____ e. increase in immigration since Time 1

   2) Time 1: 50 million people → Time 2: 30 million people

   _____ a. excess of births over deaths

   _____ b. abundant food supply

   _____ c. increased use of birth control methods

   _____ d. disease epidemic

   _____ e. increase in emigration since Time 1

3) Time 1 10,000 people ⟶ Time 2 10,000 people

_____ a. excess of births over deaths

_____ b. increased death rate

_____ c. birth rate the same as death rate

_____ d. rates of immigration and emigration are identical

_____ e. discovery of cure of a previously fatal disease in area

2. Which of the following alternatives would best explain a decline in the number of individuals in a human population. Discuss your selection with your teacher.

a) an increase in medical knowledge

b) an increase in immigration

c) a decrease in the death rate

d) discovery of a cure of a previously fatal disease in the area

e) increased use of birth control methods

3. Describe several alternatives which have resulted in the worldwide increase in world population, and outline several factors which could be instrumental in the reduction of human population in the future.

4. Which of the following alternatives would best explain an increase in the number of individuals in a human population. Discuss your selection with the teacher.

a) a decrease in immigration

b) an increase in the death rate

c) an increased use of birth control methods

d) an increase in medical knowledge

e) a decrease in the birthrate

ENVIRONMENTAL EDUCATION

Human Population Growth

EE - 7

Pre-test: #2 and #3
Post-test: #1 and #2

The student will describe forms of environmental problems which are caused by forms of energy production.

PERFORMANCE INDICATORS:

1. Economists constantly remind us that "there is no free lunch". Apply this concept to describe energy production in the United States, including geothermal power, wind power, solar energy, nuclear power, hydroelectric power, and coal-burning power plants.

2. Each form of energy production for large scale usage in a technological country has potential "pollution' drawbacks [or substitute advantages]. For each of the following, describe the potential problem [or advantages] or problems [or advantages] of geothermal energy, wind energy, solar energy, hydroelectric power, coal-burning power plants, and nuclear power.

3. Match the most likely environmental problem with the particular form of energy production.

____ 1. geothermal energy	a) air pollution
____ 2. solar energy	b) destruction of scenic views and farmlands
____ 3. hydroelectric power	c) radiation hazard
____ 4. coal-burning power plant	d) insufficient U.S. reserves
____ 5. nuclear power	

e) inability to store enough electricity so generated for large population

4. Which of the following methods of generating electricity uses a non-renewable resource. Describe orally or in writing possible environmental problems which might be associated with each.

a) tidal power

b) wind power

c) geothermal power

d) solar energy

e) coal burning power plant

ENVIRONMENTAL EDUCATION

Human Population Growth

EE - 8

Pre-test: #2 and #4
Post-test: #1 and #3

The student will compute the number of children, grandchildren, and great grandchildren which result from differing rates of population growth.

PERFORMANCE INDICATORS:

1. Draw three graphs to illustrate each of the following situations.

   a) All families have three children. Graph the number of children, grandchildren, and great grandchildren which would result from a single couple.

   b) All families have four children. Illustrate by graphing the number of children, grandchildren, and great grandchildren which would result from a single couple.

2. Human population growth is considered by many to be a serious threat to the natural resources of the earth. Discuss with your teacher the differing rates of growth which result from one child, two children, three children, and four children families.

3. Human population growth is a great concern to many due to the increased demand on natural resources by increased population. If all families had four children, how many great grandchildren would a couple have?

4. In the following items, state the number of children, grandchildren, and great grandchildren produced by the first couple.

   a) Every couple in the familes have three children

      1. number of children _____

2. number of grandchildren _____

3. number of great grandchildren _____

b) Every couple in the families have one child

1. number of children

2. number of grandchildren _____

3. number of great grandchildren _____

c) Every couple in the families have four children

1. number of children

2. number of grandchildren _____

3. number of great grandchildren _____

ENVIRONMENTAL EDUCATION

Human Population Growth

EE - 9

Pre-test: #1 and #4
Post-test: #1 and #4

The student will identify specific examples illustrating different types of competition between species.

PERFORMANCE INDICATORS:

1. Competition between species helps control the number of individuals of a species. Give examples of different types of interspecific competition and explain how they might affect population. (oral or written)

2. The ecologist Elton contends that predators live on capital, while parasites live on interest. Explain. Is this true from an individual view or from a community viewpoint? Explain. (oral or written)

3. Would you expect a deer population to be healthier after years of natural predation by wolves and cougars or by hunters with guns. Explain. (oral or written)

4. For each of the following examples, categorize the type of competition between species which is illustrated.

<u>Types of Interspecific Competition</u>

a) neutralism - little interaction
b) competition - one species tries to gain control of the resource
c) amensalism - growth of one species inhibited; that of the other unaffected
d) predation - one species eats the other
e) parasitism - a type of predation, in which the predator consumes the tissue or food supply of the living hosts
f) commensalism - one species benefits from an unaffected host
g) protocooperation - mutually favorable relationship
h) mutualism - beneficial and necessary to both parties

_____ 1. mistletoe sucks the sap from the mesquite tree on which it grows

_____ 2. a barnacle gains mobility by attaching itself to a whale, but does not consume any of the whale's tissue

_____ 3. a small bird eats the meat caught between a crocodiles teeth—the bird gets fed and the crocodile gets free dental care

_____ 4. a paramecium eats a bacterium

_____ 5. an elephant steps on an ant

_____ 6. two trees growing side by side reach out for light

ENVIRONMENTAL EDUCATION

Human Population Growth

EE - 10
Pre-test: #1
Post-test: any

The student will discuss how an increase in population will affect the future of a particular human environment.

PERFORMANCE INDICATORS:

1. If human population is destined to continue to expand, what affects will this have on you, your city, the United States, India, earth? How might such affects be altered, even with population expansion? (oral or written)

2. Large increases in human population will affect the future of different environments. Discuss with your teacher your ideas on how such population increases will affect your home; a wilderness area; New Delhi, India; your city; the entire earth.

3. Large increases in human population will affect both human and natural environments. Discuss with your teacher ways in which these environments will be affected, and how changes in natural environments will ultimately affect man.

4. Suggest two ways that a large increase in population will affect the future of each of the following environments.

   a) your home

   b) Grand Canyon National Park

   c) New Delhi, India

   d) your city

   e) the entire earth

The student will determine, from a list of possible air polluting substances or sources, which are natural and which are man-made, or discuss natural and man-made pollution.

EE - 11

Pre-test: #1 and #2
Post-test: #3 and #4

PERFORMANCE INDICATORS:

1. Place an "M" next to the item if it is an air polluting substance or source which is man-caused, an "N" next to the item if it is natural, and an "E" next to the item if it can be either man-caused or natural.

_____ 1. volcanoes

_____ 2. oil refinery

_____ 3. outer space cosmic dust

_____ 4. nitrous oxides from internal combustion engines

_____ 5. pollen

_____ 6. smoke

_____ 7. sulfer dioxide from smelters

_____ 8. radioactivity

_____ 9. carbon monoxide

_____ 10. insecticides

2. Match the following air pollutants with their causes.

_____ 1. carbon monoxide	a. natural
_____ 2. pollen	b. man-made
_____ 3. insecticides	c. either man-made or natural

3. Given the following air pollutants, group into sets those which best fit each of the descriptive categories.

a) volcanic gases	d) nitrous oxides from automobiles	g) pollen
b) radioactivity	e) carbon monoxide	h) smoke
c) insecticides	f) sulfur dioxide from smelter	i) gasoline

NATURAL	MAN-MADE	EITHER NATURAL OR MAN-MADE

4. Discuss with your teacher at least three air pollutants which are only man-made, three which are natural, and three which could be either natural or man-made.

ENVIRONMENTAL EDUCATION

The Atmosphere

The student will be able to place the constituents of dry air in order of decreasing abundance, and identify an important property or function of each.

EE - 12

Pre-test: #1

Post-test: #2 and #3

PERFORMANCE INDICATORS:

1. List in order of decreasing abundance each of the constituents of dry air and identify an important property of each.

Order of Decreasing Abundance	Important Property
1.	
2.	
3.	
4.	

2. Circle the following constituents of dry air which are in the proper order of decreasing abundance.

   a) oxygen, carbon dioxide, nitrogen, argon

   b) oxygen, nitrogen, carbon dioxide, argon

   c) carbon dioxide, oxygen, argon, nitrogen

   d) nitrogen, oxygen, argon, carbon dioxide

   e) nitrogen, carbon dioxide, oxygen, argon

3. Describe the most abundant four constituents of natural dry air and give one property or function of each. (oral or written)

4. Describe the properties and relative order of abundance of natural dry air. Discuss the difference between natural air and pure air, and point out several constituents which might vary in natural air which would not differ in pure air. (oral or written)

The student will be able to determine the air pollutant or pollutants likely to be generated by different air pollution sources.

EE - 13

Pre-test: #1

Post-test: #3

PERFORMANCE INDICATORS:

1. Choose the air pollutant most likely to be generated by different air pollution sources. Student may use a letter more than once.

_____ 1. copper smelter

_____ 2. automobile

_____ 3. coal-burning power plant

_____ 4. clearing urban land

_____ 5. fireplace

a) nitrous oxides
b) particulates
c) carbon dioxide
d) sulfur dioxide
e) lead
f) carbon monoxide
g) ozone

2. Smog:

a) is a mixture of solid, liquid, and gaseous air pollutants.

b) has a deleterious effect upon plants.

c) affects visibility.

d) is often caused primarily by automobiles.

e) all of the above.

3. The air pollutant which successfully competes with oxygen for bonding sites on the hemoglobin molecule in the blood is:

   a) ozone

   b) carbon dioxide

   c) carbon monoxide

   d) hydrogen fluoride

   e) asbestos

4. Orally identify four different types of air pollutants and their sources.

ENVIRONMENTAL EDUCATION

The Atmosphere

EE - 14

Pre-test: #1 and #2
Post-test: #3 and #4

The student will identify the cause and effect of the "green house effect".

PERFORMANCE INDICATORS:

1. Of the following atmospheric constituents, which is most responsible for the "green house effect" of heating of the atmosphere:

   a) nitrogen
   b) carbon dioxide
   c) oxygen
   d) water
   e) argon

2. The "greenhouse effect" may best be described by the following statement:

   a) a conversion of solar radiation to infrared radiation, with the subsequent trapping of this radiation by carbon dioxide molecules in the atmosphere

   b) the layering of the atmosphere due to gravity separation of the different constituents of air—some layers become warmer than others

   c) the rapid growth of vegetation during those days with greatest incident solar radiation

   d) the reflection of ultraviolet radiation from dark colored surfaces

   e) the alteration of oxygen to carbon dioxide in the atmosphere due to the heavy consumption of oxygen by plants

3. Compare the causes and physical factors involved with possible future heating of the earth's atmosphere due to increased production of carbon dioxide to any familiar process of situation in our daily lives. (oral or written)

4. The technological processes of man has greatly increased the amount of carbon dioxide in the atmosphere since the inception of the industrial revolution. Discuss the probable result if such carbon dioxide production continues and is not offset by any other natural or man-caused factors. (oral or written)

The student will identify the causes or effects of water pollution.

EE - 15
Pre-test: all
Post-test: all

PERFORMANCE INDICATORS:

Mark an "X" next to those alternative which correctly describe either the causes or effects of water pollution in the particular situation which is described.

1. The causes of eutrophication in a shallow lake in the summer are:

   _____ a) long periods of bright sunshine

   _____ b) build up of dead algae after a bloom

   _____ c) increase in mercury from agricultural pesticides

   _____ d) removal of oxygen from the water by natural processes

2. The effects on the water of a river receiving untreated sewage from a city are:

   _____ a) a change and decrease in the numbers and kinds of game and food fish in the river

   _____ b) an increase in the oxygen supply to the river

   _____ c) an increase in the dissolved solids of the river

   _____ d) an increase in the numbers of algae in the river

3. The effects on a river of factory discharge water containing mercury or other heavy metals are:

   _____ a) a build up in the concentration of the metal in game fish considerably higher than that in the river water

   _____ b) an increase in bacteria and thus a more rapid break-down of other sewage

   _____ c) a potential of disease in humans caused by too great a concentration of trace elements

   _____ d) a rapid increase in oxygen in the river resulting in increased oxidation and decay of organic matter

4. The causes of pollution of rivers receiving run-off from agricultural activities are:

   _____ a) mercury and chromium from pesticides

   _____ b) decrease in river oxygen due to run-off of form fertilizers

   _____ c) pesticides sprayed on plants

   _____ d) a decrease in silt load in the river since agricultural plants are better able to stabilize soils than natural vegetation

The student will describe how waste water is treated in three stages of sewage treatment.

EE - 16

Pre-test: #1
#2 & #3
Post-test: #4

PERFORMANCE INDICATORS:

Mark an "X" next to the alternatives which correctly describe the treatment of waste water in the named stage of the sewage treatment process.

1. Primary treatment

_____ a) water filters over a bed of rock

_____ b) filtering screens separate out

_____ c) suspended particles settle to bottom

_____ d) water is chlorinated

2. Secondary treatment

_____ a) water filters over a bed of rock

_____ b) filtering screens separate out

_____ c) nitrogen is removed by blowing air through sewage

_____ d) 90% of organic pollutants are consumed by bacteria

3. Advanced treatment

_____ a) water filters over a bed of rock

_____ b) suspended particles separate to the bottom

_____ c) nitrogen is removed by blowing air through the water

_____ d) phosphate is removed by chemical process

4. Describe primary, secondary, and advanced waste water treatment systems. Tell how they differ, the processes employed in each, and their effectiveness in removing pollutants. (oral or written)

The student will identify, in the proper order, the steps water must take before being consumed by individuals in an urban environment.

EE - 17

Pre-test: #1 and #2

Post-test: #3

PERFORMANCE INDICATORS:

1. Order the phrases below to indicate the steps water must take before reaching the urban consumer by placing #1 next to the step which would occur first, #2 next to the second step and so on.

   _____ a) rainfall

   _____ b) a water treatment

   _____ c) the water meter

   _____ d) the river

2. Order the phrases below to indicate the steps water must take before reaching the urban consumer by placing #1 next to the step which would occur first, #2 next to the second step and so on.

   _____ a) evaporation from the ocean

   _____ b) water treatment plant

   _____ c) a reservoir

   _____ d) rainfall in the mountains

3. Orally or in writing identify each of the steps through which your local drinking water passes, in their proper order, until it emerges from your household or school tap.

4. The greatest amount of our public drinking water supply in Las Vegas* is from:

   a) the Colorado River System

   b) ground water through wells

   c) spring water from the Spring Mountains

   d) rain water caught in local reservoirs in the Las Vegas Valley

   e) recycled waste water

*Each teacher will redesign this question for tests administered outside the Las Vegas region.

The student will identify from alternative examples of natural or man-induced conditions, those which would enhance and which would suppress precipitation.

EE - 18

Pre-test: #1 and #2
Post-test: #1 and #2

1. For each of the following described natural or man-induced conditions, place an "E" for those which would enhance precipitation and an "S" for each of those which would suppress precipitation.

   _____ a) a parcel of warm moist air is lifted by winds over a mountain range

   _____ b) a moving mass of cold arctic air meets a stationary mass of warm coastal air

   _____ c) a cold moisture-laden maritime air moves inland over a warm low-lying continental land mass

   _____ d) a large urban area in the summertime surrounded by nonurbanized land

   _____ e) a warm moisture-laden air mass moving through a region of industrial development with many particulates given off by chimneys or stacks

2. Which of the following conditions might create factors which would tend to suppress rainfall?

   a) a parcel of warm moist air is lifted by winds over a mountain range

   b) a moving mass of cold arctic air meets a stationary mass of warm coastal air

   c) a cold moisture-laden maritime air moves inland over a warm low-lying continental land mass

d) a large urban area in the summertime surrounded by nonurbanized land

e) a warm moisture-laden air mass moving through a region of industrial development with many particulates given off by chimneys or stacks

3. Orally or in writing, identify a natural and a man-induced condition which would enhance precipitation.

4. Recent studies have indicated that urban areas often "cause" rain, or at least that the amount of precipitation increases with increasing urbanization. Tell your teacher why this happens.

The student will identify meteorologic and geographic conditions which cause flooding.

EE - 19

Pre-test: #1 and #2
Post-test: #3 and #4

PERFORMANCE INDICATORS:

1. Place an "X" before the physical condition stated below which may be a cause for flooding conditions.

   _____ a) highly permeable soil

   _____ b) convective humid air movement

   _____ c) increased urbanization of a region

   _____ d) high intensity-long duration rainfall

   _____ e) low intensity-short duration rainfall

   _____ f) heavily forested slopes

2. Place an "X" before the conditions least likely to cause flooding conditions.

   _____ a) highly permeable soil

   _____ b) increased urbanization of an area

   _____ c) high intensity-long duration

   _____ d) summertime convective humid air movement

   _____ e) major cyclonic storms

3. Group the following physical conditions of meteorology and geography into two sets: 1) those most likely to cause flooding and 2) those least likely to cause flooding.

   a) highly permeable soil

   b) increased urbanization

   c) low intensity-short duration rainfall

   d) large cyclonic storms

   e) heavily forsted slopes

   f) summertime convective humid air movement

   g) high intensity-long duration rainfall

4. Orally identify four meteorologic or geographic conditions which may cause flooding in an urban area.

ENVIRONMENTAL EDUCATION

The Lithosphere

The student will differentiate between renewable and non-renewable resources.

EE - 20

Pre-test: #1 and #2

Post-test: #4

PERFORMANCE INDICATORS:

1. Group the following energy sources into two categories, renewable and non-rewable resources:

   a) hydroelectric power
   b) coal-produced power
   c) geothermal energy
   d) wood
   e) gas/oil
   f) solar energy
   g) wind energy
   h) fission nuclear energy

2. In each of the following items, place an "R" next to the energy source which is renewable and an "N" next to the energy source which is non-renewable.

   _____ a) hydroelectric power
   _____ b) coal-produced power
   _____ c) geothermal energy
   _____ d) wood
   _____ e) gas/oil
   _____ f) solar energy
   _____ g) wind energy
   _____ h) fission nuclear energy

3. Which of the following is an example of a renewable energy resource?

a) coal

b) natural gas

c) solar energy

d) oil

e) fission nuclear power

4. Orally or in writing describe three sources of renewable energy resources and three sources of non-renewable energy resources and discuss one disadvantage of each of the energy resources.

ENVIRONMENTAL EDUCATION

The Lithosphere

The student will identify examples of international political decisions which may be attributed to an unequal geographic distribution of mineral resources.

EE - 21

Pre-test: #1

Post-test: #3 and #4

PERFORMANCE INDICATORS:

1. Match the international political decision or action which may have resulted from an unequal geographic distribution of mineral resources with the most likely resource.

   _____ 1. Japanese expansion into the Southwest Pacific in WW II.

   _____ 2. The German invasion of Alsace-Lorraine in WW I.

   _____ 3. The German invasion of the Balkan countries in WW II.

   _____ 4. Project Independence in the U.S. in the late 1970's.

   _____ 5. C.I.A. involvement in Chilean politics in the early 1970's.

   Resources - a) oil

   b) copper

   c) coal

   d) lead

   e) gold

   f) water

2. Many countries were not "dealt a full deck" of mineral resources, according to many geologists. Opportunities for growth of production and increase in standard of living are therefore potentially limited without unhampered international trade. Identify at least three countries where the standard of living or growth of production may be curtailed due to the unequal distribution of resources.

3. As world population expands on "spaceship" earth, and demands increase for a dwindling supply of resources, some geologists are predicting dire international conflicts due to the unequal allocation of mineral and fuel resources. From the past ten years of history, orally identify at least three international events which have occurred which might be attributed to unequal mineral resource allocation.

4. Many geologists and political scientists believe that international political decisions are often the result of the unequal distribution of natural resources. Identify orally or in writing three different international actions which may have directly been the result of resource inequality.

ENVIRONMENTAL EDUCATION

The Lithosphere

The student will categorize a list of objects according to degradibility, recycability, or origin.

EE - 22

Pre-test: all

Post-test: all

PERFORMANCE INDICATORS:

In each of the following items, mark an "X" next to the one object which is best described by the type specified.

1. biodegradable
   - _____ a) aluminum can
   - _____ b) plastic bag
   - _____ c) glass bottle
   - _____ d) apple core

2. non-biodegradable
   - _____ a) potatoe peelings
   - _____ b) steak bone
   - _____ c) plastic bag
   - _____ d) kleenex

3. capable of being recycled
   - _____ a) candle
   - _____ b) newspaper
   - _____ c) gasoline
   - _____ d) styrofoam cup

4. constructed from a renewable resource

_____ a) copper wire

_____ b) furnace oil

_____ c) paper bag

_____ d) body of an auto

5. constructed from a man-made substance

_____ a) silk tie

_____ b) cotton pants

_____ c) wool sweater

_____ d) dacron blouse

The student will identify the advantages and disadvantages of different solid waste disposal methods.

EE - 23

Pre-test: #1

Post-test: #2, or #3 & #4

PERFORMANCE INDICATORS:

1. From the list below, select the name of the solid waste disposal method best matching the descriptions in each item. Place the letter of the correct method next to the description. Below the description, state one advantage or disadvantage of this method of solid waste disposal.

a) sanitary land fill
b) dumping
c) incineration
d) sewage disposal
e) composting
f) salvage and reclamation

_____ 1. general refuse disposed of in a specified area
advantage or disadvantage:

_____ 2. garbage buried with soil every day
advantage or disadvantage:

_____ 3. material reprocessed and used again
advantage or disadvantage:

_____ 4. organic material placed in piles and allowed to decompose
advantage or disadvantage:

_____ 5. materials burned at high temperature
advantage or disadvantage:

2. Orally identify the advantages or disadvantages of different solid waste disposal methods.

3. The primary advantage of compositing as a method of municipal solid waste disposal is: (Circle the correct letter)

   a) it is cheap

   b) there is little transportation expense

   c) the organic matter may be recycled

   d) health problems are eliminated

4. The primary disadvantage of the incineration method of solid waste disposal is: (Circle the correct letter)

   a) air pollution

   b) takes up too much land area

   c) most expensive method

   d) allows recycling

ENVIRONMENTAL EDUCATION

Energy

The student will be able to identify which of several energy-consuming activities consumes the most non-renewable energy.

EE - 24

Pre-test: #1 and #3
Post-test: #2 and #4

PERFORMANCE INDICATORS:

1. In each of the following items, mark an "L" next to the alternative which consumes the least non-renewable energy in terms of the entire population and an "M" next to the alternative which consumes the most non-renewable energy.

   Transportation

   _____ a. commuting by bus to work

   _____ b. commuting by car to work, one person per car

   _____ c. riding a car pool to work

   _____ d. riding a bicycle to work

   Heating (or air conditioning) the Home

   _____ a. home with south-facing windows and no insulation

   _____ b. home with only insulated walls and floor

   _____ c. home with insulated walls only

   _____ d. home with insulated roof and walls only

   Keeping Food Cold

   _____ a. refrigerator

   _____ b. refrigerator-freezer with automatic ice-maker

   _____ c. refrigerator-freezer

   _____ d. cold storage house built underground

2. For each of the following activities, mark with an "X" that which consumes the most non-renewable energy.

Preparing a Meal

_____ a. using an electric range

_____ b. using a gas range

_____ c. using a wood-burning stove

Going to Work

_____ a. by bus

_____ b. by automobile

_____ c. on foot

Heating a Home

_____ a. solar panels

_____ b. electric heat

_____ c. gas heat

3. In writing identify three consumer daily activities, state three alternative energy sources to accomplish the activity, and choose that which consumes the least non-renewable energy.

4. Orally identify to your teacher three consumer daily activities and state alternative methods to conduct the activity which would consume less non-renewable energy.

The student will determine the difference between kinetic (moving) and potential (stored) energy from a choice of alternative descriptions.

EE - 25

Pre-test: #1 and #2
Post-test: #1, and #2

PERFORMANCE INDICATORS:

1. Of the following descriptions, place a "K" in front of those which represent kinetic (moving) energy and a "P" for those of potential (stored) energy.

   _____ a. water stored behind a dam

   _____ b. a "balanced" rock

   _____ c. an elevator stopped on the 23rd floor of a building

   _____ d. a lump of coal

   _____ e. a speeding locomotive

2. Which of the following examples illustrates kinetic (moving) energy? (Circle the correct letter)

   a) water stored behind a dam

   b) a lump of coal

   c) gasoline in the fuel tank of a car

   d) a tornado

3. Fundamental to a resolution of the world's energy problems is a means of efficiently converting energy from a potential (stored) form to

kinetic (moving) without deleterious side effects. How do you believe this may not be accomplished?

4. Tell your teacher what the difference between kinetic (moving) and potential (stored) energy is, and describe the role of each in the current energy crisis in the world.

ENVIRONMENTAL EDUCATION

Energy

The student will be able to identify an example of each of the following as being that type of energy (mechanical, chemical, heat, electrical, solar, nuclear).

EE - 26

Pre-test: #1

Post-test: #4

PERFORMANCE INDICATORS:

1. Match each type of energy with an example of it. Answers are used only once.

_____ 1. mechanical	A. electrons moving through a wire cause a doorbell to ring
_____ 2. chemical	B. uranium atoms split in a chain reaction
_____ 3. heat	C. hot water in a radiator warms a house
_____ 4. electrical	D. the hands of a grandfather clock turn
_____ 5. solar	E. the sun causes the rooms of a house to be warmer during the day
_____ 6. nuclear	F. chlorine bleach burns your hands

2. Give one specific example of each of the following kinds of energy. (oral or written)

1. mechanical
2. chemical
3. heat
4. electrical
5. solar
6. nuclear

3. Fill in the blanks with the following forms of energy: mechanical, chemical, heat, electrical, solar, and nuclear.

When you take a shower in hot water and you get warm, you are receiving _____ energy. When you lift a heavy load by using a pulley, the load is directly receiving _____ energy. The food we eat is actually a form of _____ energy. The energy that comes from a car battery is called _____ energy. The energy created when photons strike any surface is called _____ energy. When an atomic bomb goes off it releases _____ energy.

4. The following are examples of energy. Tell whether each is either mechanical, chemical, heat, electrical, solar, or nuclear energy. There is only one example of each. (oral or written)

1) A rock is lifted by a man.

2) It hurts to sit on the burner of your stove when it is turned on.

3) A car consumes gasoline.

4) A fission reaction is created.

5) A black sheet of paper gets hot out in the sun.

6) A generator makes electrons flow through a wire.

ENVIRONMENTAL EDUCATION

Energy

The student will define the first and second laws of thermodynamics.

EE - 27

Pre-test: #1 and #2
Post-test: #1 and #2

PERFORMANCE INDICATORS:

1. Which of the following statements most clearly defines the first law of thermodynamics?

   a) energy cannot be created or destroyed

   b) the heat within a building or other enclosed space cannot exceed by more than a factor of two the temperature outside the enclosure

   c) energy can be recycled, even if materials cannot

   d) there is a constant loss of useful worth when energy is converted from one form to another

2. Which of the following statements most clearly defines the second law of thermodynamics?

   a) energy cannot be created or destroyed

   b) the heat within a building or other enclosed space cannot exceed by more than a factor of two the temperature outside the enclosure

   c) energy can be recycled, even if materials cannot

   d) there is a constant loss of worth when energy is converted from one form to another

3. The law of conservation of energy applies to:

   a) the hydrosphere

   b) the biosphere

   c) the atmosphere

   d) all components of the universe

4. The first law of thermodynamics has often been described as the statement "you can't win". The second law is often stated as "you can't even break even". Discuss these laws and the statements about them.

ENVIRONMENTAL EDUCATION

Ecosystem Components

The student will be able to describe the nitrogen cycle.

EE - 28

Pre-test: #1, #2 & #3
Post-test: all

PERFORMANCE INDICATORS:

1. The usable form of nitrogen for plant organisms is:
   a) nitrogen gas
   b) nitrites
   c) ammonia
   d) hydrogenated ammonia
   e) nitrates

2. Nitrogen within living organisms occurs in the form of:
   a) carbohydrates
   b) protein
   c) fats
   d) nitrates
   e) ammonia

3. Which of the following statements about the nitrogen cycle is incorrect:

   a) animals store nitrogen within their protein

   b) gaseous nitrogen may be fixed into nitrates by lightning

   c) nitrates in the soil may be identified and gaseous nitrogen returned to the atmosphere

   d) decomposition of organic matter can yield ammonia, an important part of the nitrogen cycle

   e) nitrogen is fixed into animal protein by the lungs removing nitrogen from the air

4. Diagram the nitrogen cycle and state the importance of both the plant and the animal components.

ENVIRONMENTAL EDUCATION

Ecosystem Components

The student will describe the role of living organisms in the carbon dioxide-oxygen cycle.

EE - 29

Pre-test: #1 and #4
Post-test: #1, #3 & #4

PERFORMANCE INDICATORS:

1. Which of the following statements regarding the carbon dioxide-oxygen cycle is correct:

   a) animals use up carbon dioxide during photosynthesis

   b) decomposition of plants and animals returns carbon dioxide into the environment

   c) animals exhale oxygen which is usable by plants in their respiration

   d) plants carry on respiratory (transpiration) processes which release carbon dioxide and use up oxygen

   e) animals use carbon dioxide as a nutrient, where as plants do not

2. Two major man-caused factors may severely alter the oxygen-carbon dioxide cycle in the future. These changes may result from an increase in carbon dioxide due to the burning of fossil fuels and the potential decline in oxygen due to the destruction of tropical forests and phytoplanleton in the ocean. Discuss the ramifications.

3. Describe the carbon dioxide-oxygen cycle and state two ways in which man's activities have appreciably begun to interfere with the cycle.

4. Draw a diagram illustrating the oxygen-carbon dioxide cycle. Label all parts of the cycle.

ANSWERS

EE - 1

1. c

2. 1) b
   2) a
   3) a
   4) b

3. d

4. See answers for #1, #2 and #3.

EE - 2

1. 1) c
   2) c
   3) c
   4) a

2. d

3. Those controled by federal government are 1), 2) and 3)

4. See answers for #1, #2 and #3.

EE - 3

1. 1) a. Rapid tranist pollutes the air less and also consumes less fuel per passenger mile.

   b. The automobile may get one closer to work.

   2) a. Plane is faster.

   b. Automobile is less expensive.

   3) a. Train causes less pollution.

   b. Bus is less expensive and goes to a greater variety of places.

   4) a. Bicycle uses less fuel.

   b. Automobile may be faster.

ANSWERS

2. Category 1 - a
   Category 2 - a
   Category 3 - a
   Category 4 - b
   Category 5 - a
   Category 6 - b

EE - 4

1. 1) c
   2) a
   3) b
   4) f
   5) b
   6) d

2. Origins stated in terms of the immediate environment (i.e. water from a faucet, food from a grocery store) are not acceptable.

3. 1) f
   2) b
   3) a
   4) d
   5) e
   6) c

4. See answer #2.

EE - 5

1. 1) a
   2) b
   3) b
   4) c
   5) d
   6) c
   7) a
   8) d

2. residential - a, g
   commercial - b, c, i
   industrial - d, f
   open space - e, h

3. Same as #2.

EE - 6

1. 1) a, e
   2) c, d, e
   3) c, d

2. e

ANSWERS

3. Increase in medical knowledge is the primary reasen. Increase in technology results in worldwide increased food and supply. With increasing technology, standard of living and higher Gross National Product, the size of a family drops.

4. d

EE - 7

1. See answers #3 and #4.

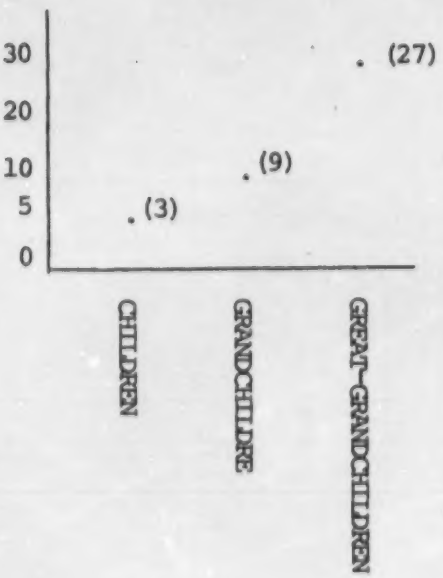
2. 64

3. 1) d
   2) d
   3) b
   4) a
   5) c

4. e

EE - 8

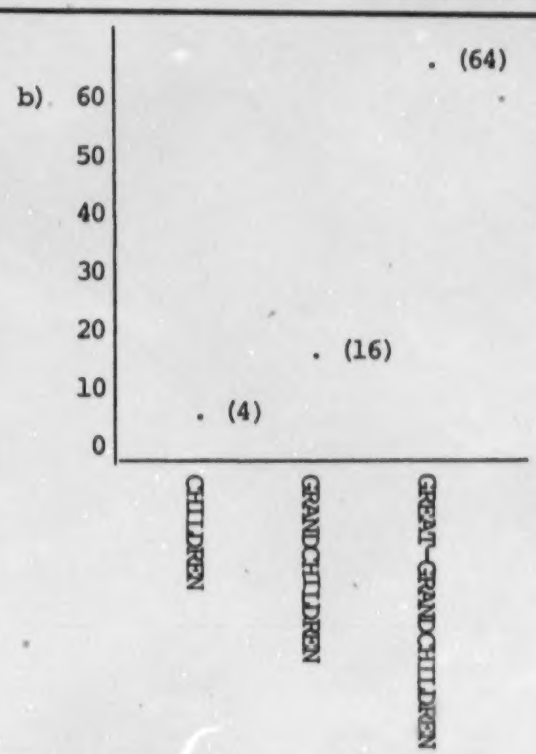
1. a)



64

ANSWERS

b)



2. See answers from #1, #2 and #3.

3. See answers from #1, #2 and #3.

4. a) 1. 3
   2. 9
   3. 27

   b) 1. 1
   2. 1
   3. 1

   c) 1. 4
   2. 16
   3. 64

EE - 9

1. See answers for #3 and #4.

2. See answers for #3 and #4.

3. Deer population would be healthier with natural predation; predators select the weak, old, and sick. Hunters kill the prime; it weakens the herd genetically.

ANSWERS

4. 1) e
   2) f
   3) g
   4) d
   5) c
   6) b

EE - 10

For all questions:

Possible effects are less food resulting in increase of starvation; increase of air pollution and solid wastes; decrease of natural resources such as water, coals, other fuels, timber, minerals, and wilderness areas.

EE - 11

1. 1) N
   2) M
   3) E or N
   4) M
   5) N
   6) E
   7) M
   8) E
   9) E
   10) M

2. 1) c
   2) a
   3) b

3. Natural - a, b, e

   Man-made - c, d, g, i

   Either Natural or Man-made - f, h

4. See answers to #1, #2 and #3.

EE - 12

1. 1) nitrogen - important for plant life. Also dilutes the oxygen which is flammable.

   2) oxygen - necessary for most life forms. Allows oxidation, a chemical change which results in weathering and decay.

ANSWERS

3) argon - an inert gas

4) carbon dioxide - essential for plant life, causes "greenhouse effect".

2. d

3. See answers #1, #2 and #4.

4. Natural air may differ from area to area in particulates or trace gases given off by volcanos or other natural processes. Pure air is constant and would be defined as "average" air not altered significantly by man.

EE - 13

1. 1) d
   2) a, e, f, g
   3) b, c, d
   4) b
   5) b, c

2. e

3. c

4. See answers #1, #2 and #4

EE - 14

1. b

2. a

3. Could be compared to heating of a car parked in the sun. Conversion of radiation to IR with the increase in temperature. Car body trapping heat would be similar to carbon dioxide in atmosphere trapping heat. Any other similar comparisons would be suitable.

4. A general question relating to increase in temperature of the earth's atmosphere. Results could include world wide temperature changes, expansion of deserts, melting of polar ice caps, etc.

ANSWERS

EE - 15

1. a, b, d
2. a, c, d
3. a, c
4. b, c

EE - 16

1. a, c
2. a, d
3. c, d
4. See answers #1, #2 and #3.

EE - 17

1. a) 1
   b) 3
   c) 4
   d) 2
2. a) 1
   b) 4
   c) 3
   d) 2
3. This will differ in different parts of the state. Each teacher will be familiar with their own area.
4. a

EE - 18

1. a) E
   b) E
   c) S
   d) E
   e) E

ANSWERS

2. c

3. See answers to #1.

4. More dust; moisture from air conditioner, industrial processes, lawns, etc. Heat of paned areas and roofs causes rising bubble of warm moist air. Condenses with altitude and rains.

EE - 19

1. a)
   b) X
   c) X
   d) X
   e)
   f)

2. a) X

3. Most likely - b, d, f, g

   Least likely - a, c, e

4. See answers #1, #2 and #3.

EE - 20

1. Renewable - a, c, d, f, g

   Non-renewable - b, c, e, h

2. a) R
   b) N
   c) R or N
   d) R
   e) N
   f) R
   g) R
   h) N

3. c

EE - 21

1. 1) a
   2) c
   3) a
   4) a
   5) b

ANSWERS

2. Instructor may select particular countries.

3. See answers for #1.

4. See answers for #1.

EE - 22

1. d
2. c
3. b
4. c
5. d

EE - 23

1. 1) b advantage - pollution localized
disadvantage - space problem, disease vectors, visual pollution

2) a advantage - health and pollution problem eliminated
disadvantage - takes considerable space, hazard to ground water

3) f advantage - recycling
disadvantage - expensive

4) e advantage - fertilizer produced, recycling
disadvantage - expensive; doesn't handle non-biodegradables

5) c advantage - little land required
disadvantage = air pollution possible, many items don't burn

3. c
4. a

ANSWERS

EE - 24

1. Transportation
   least - d
   most - b

   Heating
   least - d
   most - a

   Keeping Food Cold
   least - d
   most - b

2. Preparing a Meal - a

   Going to Work - b

   Heating a Home - b

3. See answers in #1 and #2.

4. See answers in #1 and #2.

EE - 25

1. a) P
   b) P
   c) P
   d) P
   e) K

2. d

4. Potential is stored energy; kinetic is the energy of motion.

EE - 26

1. 1) D
   2) F
   3) C
   4) A
   5) E
   6) B

ANSWERS

2. 1) mechanical - a water wheel turns a mill stone through a series of gears.

   2) chemical - dynamite explodes.

   3) heat - a fire cooks food.

   4) electrical - electrons moving through a wire make a light bulb glow.

   5) solar - photons excite a photoelectric cell.

   6) nuclear - radium watch dials glow.

3. heat, mechanical, chemical, electrical, solar, nuclear

4. 1) mechanical
   2) heat
   3) chemical
   4) nuclear
   5) solar
   6) electrical

EE - 27

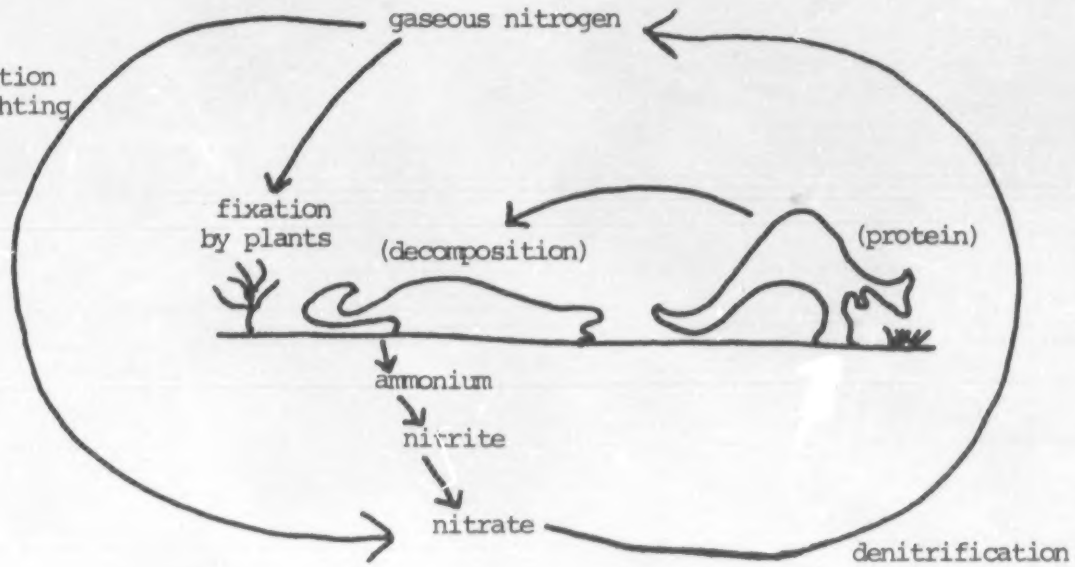
1. a
2. d
3. d

EE - 28

1. e
2. b
3. e

ANSWERS

4.



EE - 29

1. c

2, 3 and 4